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ABSTRACT

Computer Literacy Program Briefs for seven schools and/or school districts are presented. Topics covered in each brief include: the institution or institutions covered, the educational program strategies, the target student audience, major components of the instructional program, illustrative examples of specific objectives, organization of the instructional package, facilities and equipment used, the nature and extent of teacher training, classroom activities and resource materials, and the impact and effect of the computer literacy program. (MF)

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HUMAN RESOURCES RESEARCH ORGANIZATION
300 N. WASHINGTON STREET
ALEXANDRIA, VA 22314

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Highline School District, Seattle, Washington — 21,000 Enrollment, K-12

STRATEGY: In 1968-69, a long-range program for computer education was established by the District Administration, including the following goals.

1. Expose all students at some level to basic computer concepts.
2. Give students in mathematics and science courses the opportunity to use the computer for problem solving.
3. Provide pre-vocational training for students with a desire to enter the field of data processing.
4. Provide opportunities in other areas for computer utilization by both teachers and students.
5. Allow for a variety of approaches and equipment in order to remain flexible in the dynamic computer technology.

The strategy for goals 1 and 2 involves incorporation of two, 3-week computer literacy units into mathematics classes, grades 7-12.

Elective courses in programming are offered at high school level.

TARGET AUDIENCE: Grades 7-12, all students

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MAJOR COMPONENTS:

- Computer Roles in Society
- Programming Skills
- Applications

SPECIFIC OBJECTIVES (ILLUSTRATIVE):

The student will be able to:

- Identify components of digital computer hardware.
- Identify functions and activities of the school that uses computers.

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Highline School District (cont'd)

- Convert octal numbers to binary.
- Identify reasons for flowcharting.
- Write and test a program for the HP 9100A programmable calculator to:

  find rate of discount
  multiply fractions
  convert Fahrenheit to Centigrade
  compute slope of a line
  determine nature of the roots of a quadratic equation

- Write and test a program in BASIC to calculate volume of spheres

ORGANIZATION

In 1967, the District administration set up a task force to establish a long-range plan for instructional computing.

District Coordinator of Mathematics and Science, Consultant of Computer Education, and Manager of CAI provide support and coordination for programs.

Mathematics teachers (and some science teachers) teach the literacy units.

The program is funded with District general funds and costs less than $10 per pupil per year.

FACILITIES

Equipment is rotated among schools on a scheduled basis.

- 6 programmable calculators, HP 9100 and HP 9810, card readers, large screen displays, and xyz plotters.
- Minicomputer HP 2000F
- UNIVAC 9030 for advanced programming
- Other computers and terminals used for CAI drills and for CMI

TEACHER TRAINING: Paid in-service workshops in the summer; summer writing teams to prepare curricular materials; support and consulting from professional staff.

Highline School District (cont'd)

ACTIVITIES AND RESOURCE MATERIALS

A Unit of Study in Computer Education for Junior High School, written by E. Hirota and V. Jacobson, math instructors, Highline Public Schools.

Provides teaching outlines, lists of films and other resource materials available from the Instructional Materials Library, student activities and problem sets, program solutions, quizzes (126 pp).

IMPACT AND EFFECT

- Approximately 4800 students a year take the unit of study each year.
- The relatively high level of computer literacy among administration, staff and teachers has resulted in a wide spectrum of computer applications to learning, including testing, computer-monitored learning, drills, business education applications, locally developed data base for career exploration, and computer science program.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Maple Lake High School
Maple Lake, Minnesota
500 Enrollment, 7-12

STRATEGY:

1. All 8th grade students required to take 9-week introduction course.
2. Senior high students offered a variety of computer electives.
3. Computer use integrated into variety of science, math, and English courses.

TARGET AUDIENCE: All students graduating in 1979 and therafter will have had at least nine weeks of exposure to the computer at minimum, and 50% will have had more extensive work.

MAJOR COMPONENTS: All

ORGANIZATION: Program offered as part of the mathematics curriculum and is taught by math teachers.

FACILITIES: Two terminals to the MECC network. Terminals are moved into classrooms equipped with telephone jacks. Computer available 6 hours per day.

TEACHER TRAINING: About half of the faculty have attended workshops and college classes. Paid release time provided by school for attendance. Educational Computer Services Coordinator spends one hour per day offering computer services to other teachers.

ACTIVITIES AND RESOURCE MATERIALS

Texts used in 8th grade classes:

- My Friend the Computer by Jean Rice
- What is a Computer? by Marion Ball
- Computers by William Corliss

Maple Lake High School (cont'd)

The elective course, "Information Gathering," offered by the English Department uses the computer to illustrate applications of information storage and retrieval.

IMPACT AND EFFECT: One-third to one-half of the student body participates in computer courses annually. About 80% of students use computing in some way each year in their courses.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Richardson Independent School District
Richardson, Texas 36,000 Enrollment, K-12

STRATEGY:

1. Incorporate computer programming unit in 8th grade mathematics classes.
2. Offer three-quarter courses (12 weeks per quarter) to 11th and 12th grades--an intensive computer mathematics program.
3. Encourage student participation in computer clubs and programming contests.

TARGET AUDIENCE: Every secondary school student has the opportunity to obtain computer instruction. All 8th grade mathematics classes will include computer instruction by 1980.

MAJOR COMPONENTS:

- Programming and problem-solving skills
- Computer systems, hardware and software
- Computer applications in mathematics

SPECIFIC OBJECTIVES (ILLUSTRATIVE):

The student will be able to:

- Convert numbers, e.g., from binary to decimal, octal to binary, binary to hexidecimal.
- Write a program in machine language.
- Describe advantages and characteristics of an assembly language.
- Write BASIC programs to manipulate string variables, subscripted variables, N-dimensional arrays.
- Write BASIC and FORTRAN programs for applications in probability and statistics, game theory, simulation, complex numbers.

Richardson Independent School District (cont'd)

ORGANIZATION

Computer literacy courses are provided by the Mathematics Department under the leadership of the Secondary Consultant for Mathematics. The four instructors are members of the mathematics faculty who have extensive knowledge of and experience in computer operations and languages.

The program is locally funded with an approximate cost of $20 per student including software, hardware, and computer time.

FACILITIES

Richardson ISD uses the facilities of the Education Service Center Region X's two HP 2000 Access Systems for interactive computing, and the facilities at the University of Texas at Dallas for batch processing.

Twenty-one terminals are available for student use, distributed two to a high school and one to a junior high school. Terminals are in continuous use from 7:30am to at least 4pm.

Software emphasis is on providing access to a variety of languages, including not only BASIC and FORTRAN, but also ALGOL, COBOL, SNOBOL, COMIT, and TRAC.

ACTIVITIES AND RESOURCE MATERIALS

1. See course outlines for Computer Mathematics 1-3.

2. Primary student activity is writing programs.

IMPACT AND EFFECT

- The computer mathematics courses have evolved from one class of 25 students in 1967, to 350 11th and 12th grade students for the 1977-78 school year.

- About 12% of 8th grade students have math courses that incorporate a computer unit.

- High school students have written computer programs, including a FORTRAN compiler, that have been included in the Service Center Region X systems library. The FORTRAN compiler has also been purchased by other computer centers around the nation and by Hewlett-Packard.

Richardson Independent School District (cont'd)

- Richardson students have won regional programming contests every year and have received various scholarships as a result of their programming excellence.

- Follow-up studies of the computer math students show that 99% attend college, and many enrolled in computer-related fields of study.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Riverdale Country School, Bronx, New York — Private, Coed, 950 Enrollment, K-12

STRATEGY:

1. Two-week unit in programming during 8th and 10th grade mathematics prepares students for problem-solving in high school.
2. Teacher training
3. Computer science course electives tailored to academic applications areas, e.g., "Computer Applications in Social Sciences."
4. Use of computer for problem solving in nearly all math courses.
5. Exposure of elementary students to computer use via math drills.

TARGET AUDIENCE: All students and teachers

MAJOR COMPONENTS:

- Programming and Problem Solving.
- Applications in math, science, statistics, urban planning, economic forecasting, simulation.

ORGANIZATION

The Computer Center Director manages both administrative and instructional computing. Students are the staff for the computer center, and write instructional programs.

Mathematics Department runs the computer literacy and computer science programs.

Riverdale Country School (cont'd)

FACILITIES:

- DEC PDP 11/34
- 16 terminals in 5 campus locations, including portables for home use by students and faculty. Most immediate need is to increase number of terminals
- Estimated budget for computing equipment is $13,000 for FY 1978-79.

TEACHER TRAINING:

- Since 1974, annual workshops have been provided for training new teachers and reviewing techniques with teachers who already know programming.
- Focus of workshops is on existing programs that teachers can use in their classes.

ACTIVITIES AND RESOURCE MATERIALS

- A Guided Tour of Programming in BASIC, by T. Dwyer and M. Kaufman is used with grades 5-6.
- Basic BASIC by J.S. Coan is used with grades 8-10.
- High school students wrote Math Strands, a series of drill-and-practice programs used by elementary students.

IMPACT AND EFFECT

- All students learn programming skills.
- About 30-40 students per year take more advanced elective courses.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: San Jose Unified School District
San Jose, California

Enrollment 36,000; 1700 teachers.
37 elementary schools; 7 junior high schools;
6 senior high schools; 1 alternative high school;
1 vocational center

RATIONALE: Computers are everywhere; microcomputers make school computing afforadable. State of California Mathematics framework includes a computer strand.

STRATEGY:

1. Computer literacy is the goal of the junior high program.
2. Encourage instructional computing by installing microcomputers in every school.
3. Modify mathematics curriculum to reflect effects of inexpensive computing devices.
4. Provide at least a few minutes of hands-on computing experience to every 7th and 8th grade student a year.
5. Classroom applications should not develop at a rate faster than the teacher's ability to incorporate them into the curriculum.

TARGET AUDIENCE: All junior high school students (7th & 8th grades)
Interested senior high students

MAJOR COMPONENTS:

- Programming and problem-solving skills
- Microcomputer systems, hardware and software
- Computer applications

San Jose Unified School District (cont'd)

ORGANIZATION:

The District Supervisor of Science and Mathematics has taken leadership in providing microcomputer equipment for all schools in the District.

One teacher from each high school has taken responsibility for introducing computing into the curriculum. The junior high school math teachers operate as a team.

FACILITIES:

- DEC PDP 8; 25 microprocessors including DEC LSI 11; PET; Apples; IMSAI; Polymorphic; and Cromemco. (HP 2000 and 24 terminals used for vocational training.)
- Three terminals at each high school and 1-3 terminals at each junior high.
- Microcomputers purchased at an average cost of $3000 each.

TEACHER TRAINING:

- Math teachers became familiar with BASIC and computer programming through use of timesharing over the past 4 years. With the introduction of micro's, teachers had to learn how to operate a computer.
- People's Computer Company provided nine 2-hour workshops for 30 secondary math and science teachers. Each high school bought a $160 single board micro kit which the teachers assembled and used to learn about architecture, operation, machine level programming, input/output routines, etc.

ACTIVITIES AND RECOURSE MATERIALS

- A common mode for teaching BASIC is the self-study booklet "My Computer Likes Me" by Bob Albrecht.
- Use BASIC programs which are appearing in elementary and secondary mathematics texts.
- Plan to write syllabus for junior high literacy course.

San Jose Unified School District (cont'd)

IMPACT AND EFFECT

Proposition 13 has had a "devastating" effect on the school district, according to Peter Grimes, the Supervisor of Science and Mathematics. The computer literacy program has suffered as a result.

The computer literacy strategy at San Jose depends heavily on leadership of the Supervisor of Science and Mathematics, and upon the enthusiasm of teachers. These two elements are now missing due to the following developments:

- Position of Supervisor of Science and Mathematics is abolished, along with the entire Department of Instruction.
- Two- to four-hundred teacher layoffs are expected next year.
- No pay increases for any personnel.
- Teacher slowdown, threatened strike, and overall loss of morale.

As a consequence, Peter Grimes has not been able to have any meetings with teachers this year; the planned computer literacy syllabus has not been written; the microcomputers are used only 1 or 2 periods a day; the junior high school literacy program has not been instituted; no equipment maintenance money is available; telecommunications costs for PDP 8 terminals are not affordable; and teacher training in computing is discontinued.

A cadre of 15-20 teachers continue to offer elective courses in programming in the high schools.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Sehome High School, Bellingham, Washington — 1440 Enrollment, 9-12

RATIONALE: We live in a computerized society. Students need to learn computer applications and usefulness of computers to business and industry.

STRATEGY:

1. Computer Club initiated projects, earned money for equipment, got support from local business and industry, got budget dollars from school board, got technical assistance from local university.

2. Computer Science Teacher worked closely with community leaders, college, business and industry.

3. Computer course electives offered:

   - Computer Concepts
   - Computer Programming
   - Computer Projects
   - Computer Design and Construction

4. Exposure to computers for larger number of students via CAI drill and practice in math, and Career Information System.

TARGET AUDIENCE: The computer courses are elective; some aimed at highly motivated and advanced students.

MAJOR COMPONENTS:

- Computer Construction and Design
- Programming and Problem Solving
- Applications in business and math

Sehome High School (cont'd)

ORGANIZATION

Computer Science teacher teaches all computer courses, advises the Computer Club, coordinates all equipment acquisition, maintenance and use, trains faculty.

School District submitted to voters a Special Levy in 1977 which contained $6,000 for purchase of terminals and lease of computer time. Vote was 80% favorable.

Students' Computer Club acquired over $6,000 of goods and services for computing through their community activities.

FACILITIES:

- Three terminals to Western Washington State College, IBM 360/40
- Students installed over 2,000 feet of donated underground cable between the High School and the College.
- Student-built 16K SOL-20 microcomputer.

ACTIVITIES AND RESOURCE MATERIALS

- A Computer Dance featured computerized dating application and a microcomputer displaying color graphics patterns.
- Students visit local business and industry to talk with programmers, operators and data processing managers.
- Students constructed microcomputer from kit.
- See "Sehome Computer Concepts Problem Sets."

IMPACT AND EFFECT

- From 1967 to 1976, student enrollment in computer classes has been stable at about 160 per year.
- About half of the student body uses computer for some purpose, mostly Career Information.

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COMPUTER LITERACY PROGRAM BRIEF

INSTITUTION: Teaneck High School, Teaneck, New Jersey 1700 Enrollment

RATIONALE: Take advantage of instructional opportunities provided by computing.

STRATEGY:

1. A one-semester computer literacy elective is offered each year.
2. Demonstrations and study units are included in existing courses.
3. Teachers are trained, encouraged, and provided support for computer innovations in their courses.

TARGET AUDIENCE: All students and teachers

MAJOR COMPONENTS: Computer impact in society, variety of applications, introductory programming, and problem-solving skills.

SPECIFIC OBJECTIVES (ILLUSTRATIVE):

The student will be able to:

- Operate a time-shared terminal to request reports from a prewritten program.
- Interpret a flowchart for a common data processing application.
- Use BASIC statements and commands to write a program.
- Use concepts such as "alphanumeric strings" in a program.
- Interpret graphs and reports produced by a prewritten simulation program.
- Identify factors that influence a simulation model.
- Identify strengths and weaknesses of a specific simulation model.
- Use mathematical programming concepts such as random number generation in writing a program.

Teaneck High School (cont'd)

- Use two-dimensional arrays and nested loops in writing a program.
- Describe the use of a computer terminal as a means of communicating with the computer and a large data base.
- Prepare a report describing a problem, algorithms used to solve the problem, flowchart depicting the algorithms, and computer program written to implement the logic.

ORGANIZATION

In 1973, a separate instructional computing department was established to foster development of applications in all subject areas, including computer literacy and computer science. This department has separate facilities and staff from administrative computing.

Two full-time teachers in this department teach computer literacy and computer science courses; obtain curriculum materials and computer programs for teachers in all disciplines; provide formal and informal assistance to faculty, and provide teacher training; and manage computing facilities.

The cost of the computer literacy elective is approximately $35 per student, excluding staff.

The budget for instructional computing department for 1976-77 was $35,000 for staff and $25,000 for equipment and supplies.

FACILITIES

Computers used include a PDP 11/10 for advanced computer instruction, an HP 2000F used for the majority of applications, and access to an HP 3000 for advanced applications and guidance (GIS).

The high school has 18 CRTs, hardcopy, and portable terminals, arranged in the following locations:

- 6 terminals used for CAI in mathematics, reading, and language arts, located in a multi-discipline Learning Center.
- 5 terminals in a computer lab used for teaching computer literacy and computer science courses.
- 4 terminals in a computer lab available for individual teacher and student use.
- 2 portable Digi-log terminals used for classroom demonstrations, and available for student and faculty use on evenings and weekends.
- 1 terminal used for GIS.

Teaheck High School (cont'd)

Software emphasis is on establishment of an extensive library of prewritten computer programs that teachers and students can use for demonstrations and instruction.

Programming languages available include BASIC, FORTRAN, COBOL, and assembly languages.

TEACHER TRAINING

1. Formal and informal assistance is provided to faculty by the two full-time staff members of the Computer Resource Center.

2. Curricular materials appropriate to the various disciplines are acquired by the Computer Resource Center and distributed to the appropriate faculty members and departments.

3. Department meetings are dedicated to demonstration and discussion of appropriate instructional applications.

4. Development of computer-oriented study units is accomplished as part of in-service program.

5. A summer workshop to prepare staff members for CAI is offered.

6. Subject supervisors encourage faculty to experiment with new applications.

ACTIVITIES AND RESOURCE MATERIALS

1. See outline for "An Introductory Computer Literacy Course."

2. Students work with prewritten programs from areas of business data processing, environmental and social science simulation, data base management, computer recreation, and computer-assisted instruction.

3. Books, texts.

IMPACT AND EFFECT

- Between 100 and 170 students take the elective computer literacy course each year. The course meets five days each week for 45 minutes each day.

- About 200 students per year take the course, America's Future, which incorporates a unit on computer impact on society.

Teaneck High School (cont'd)

- Computer-oriented units are incorporated in social science and physical science courses, including economics, American government, American history, psychology, European history, physics, physical science, astronomy, and independent study.

- About 20% of faculty and about a third of the students use computer applications during the course of a year.